

PATENT ABSTRACTS OF JAPAN

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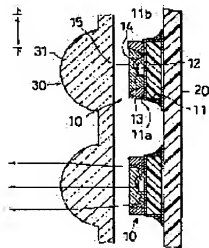
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(54) DOT MATRIX DISPLAY

(57)Abstract:

PURPOSE: To present a dot matrix display device capable of minimizing optical loss, and what is more, providing high luminous intensity.

CONSTITUTION: A plurality of surface packaging type light emitting diodes 10, which mount a reflection frame 13 around a light emitting element 12 fixedly mounted to a small substrate 11 are crosswise mounted to a board 20 at a specified span and a lens 30 is laid out near the light emitting plane of each surface-packaging type light emitting diode 10 where the lens 30 is flat on the bottom and provided with a cylindrical lens 31 laid out in parallel on the top of the lens 30.



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CLAIMS

[Claim(s)]

[Claim 1] The dot-matrix display characterized by to arrange the lens in which two or more surface mount form light emitting diodes which come to attach a reflective frame in the perimeter of the light emitting diode component which fixed on the small substrate were mounted on the substrate at intervals of predetermined in all directions, the luminescence side of each of said surface mount form light emitting diode approached, and an inferior surface of tongue had the convergent-lens structure as for which was flat and the convergency of the vertical direction became higher than the convergency of a longitudinal direction at the top-face side.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the dot-matrix display which used light emitting diode.

[0002]

[Description of the Prior Art] Conventionally, as shown in drawing 7, this kind of dot-matrix display equips with the mask plate 3 which has two or more opening 3a which has arranged two or more light emitting diode lamps 1 equipped with dome-like lens section 1a on a substrate 2 by fixed Bitsch in all directions (for example, 16x16 or 24x24), and was formed in the same pitch as the array pitch of a light emitting diode 1 on it, and is constituted.

[0003]

[Problem(s) to be Solved by the Invention] However, in the case of the conventional example which has such a configuration, there are the following problems. That is, as for the lateral portion of lens section 1a, and the conventional dot-matrix display using those with a considerable amount, therefore such a light emitting diode lamp 1 in the light to which it suits and ** is emitted from a bottom surface part, the light emitting diode lamp 1 equipped with dome-like lens section 1a has the trouble that there is much optical loss, on the configuration. [0004] Moreover, although the light emitting diode lamp 1 mentioned above is equipped with the same directivity to the perimeter enclosure, this cannot say it as the property more desirable than the reason mentioned later for a dot-matrix display. Hereafter, it explains with reference to drawing 8. A sign 4 is the display unit which consisted of two or more dot-matrix displays among drawing. Generally, although the display unit 4 is looked at by two or more observers from the location of arbitration, there is no great difference in the height of each observer's look. Therefore, although it is desirable to have directivity large about a longitudinal direction as for the display unit 4, about the vertical direction, narrow directivity is sufficient for it.

[0005] Since the light emitting diode lamp 1 is equipped with the same directivity as a perimeter enclosure against the request on such directional characteristics as mentioned above, if it is going to extend the directivity of right and left of a dot-matrix display, up-and-down directivity will spread inevitably. Consequently, since an excessive light which is not recognized by the observer will be emitted in the vertical direction, there is a trouble that luminous intensity of the dot-matrix display seen from the observer cannot fully be raised. On the contrary, if up-and-down directivity tends to be narrowed and it is going to raise luminous intensity, the contents of a display will be hard coming to see the observer to whom directivity on either side has not met narrowing and the display unit 4.

[0006] This invention is made in view of such a situation, and aims to let optical loss offer a dot-matrix display with high luminous intensity few.

[0007]

[Means for Solving the Problem] This invention takes the following configurations, in order to attain such a purpose. That is, the dot-matrix display concerning this invention mounts on a substrate two or more surface mount form light emitting diodes which come to attach a reflective frame in the perimeter of the light emitting diode component which fixed on the small

substrate at intervals of predetermined in all directions, and approaches the luminescence side of each of said surface mount form light emitting diode, an inferior surface of tongue is flat, and the convergency of the vertical direction arranges a lens with the convergent-lens structure which became higher than the convergency of a longitudinal direction at the top-face side.
[0008]

[Function] Since the reflective frame is attached in the perimeter of a light emitting diode component according to this invention, it is reflected by said reflective frame and the light by which outgoing radiation was carried out towards the side from the light emitting diode component is turned in the direction of a front face (luminescence side). Moreover, since the inferior surface of tongue of the lens by which opposite arrangement was carried out at each surface mount form light emitting diode is flat, whenever [incident angle / of the incident light from surface mount form light emitting diode] becomes comparatively small, and reflection on the lens inferior surface of tongue is controlled. Furthermore, in the vertical direction which is not recognized by the observer while an observer can see a dot-matrix display from the large area of a longitudinal direction since the convergency of the vertical direction has become higher than the convergency of a longitudinal direction as for the convergent-lens structure with which the top-face side of said lens was equipped, since the exposure of light is controlled, the luminous intensity of the part and equipment can be raised.

[0009]

[Example] Hereafter, one example of this invention is explained with reference to a drawing.

<1st example> drawing 1 is the decomposition perspective view having shown the outline configuration of the 1st example of the dot-matrix display concerning this invention. This dot-matrix indicating equipment is equipped with the substrate 20 mounted in all directions at fixed spacing in two or more surface mount form light emitting diodes (chip form light emitting diode) 10, and the lens 30 by which contiguity disposition is carried out at each surface mount form light emitting diode 10.

[0010] As shown in drawing 2, each surface mount form light emitting diode 10 arranged on a substrate 20 consists of reflective frame 13 grades arranged in the perimeter of the light emitting diode component 12 which fixed to rectangle-like the small substrate 11 and said small substrate 11, and the light emitting diode component 12. The small substrate 11 is formed with the ingredient with thermal resistance like for example, BT (bismaleimide triazine) resin. In order to gather the reflective effectiveness of light, as for this small substrate 11, it is desirable to make it white. On the small substrate 11, the lead electrodes 11a and 11b prolonged on an opposite side face, respectively are formed. The light emitting diode component 12 has fixed on lead electrode 11a, and between lead electrode 11b is connected with this light emitting diode component 12 with the metal thin line 14.

[0011] since it is formed by white PBT (polybutylene terephthalate) resin and the internal reflection side reflects the incident light from the light emitting diode component 12 upwards, for example, the reflective effectiveness of light of the reflective frame 13 which encloses the light emitting diode component 12 is good -- grinding -- punishment -- it inclines in the **. The interior of opening of the reflective frame 13 is filled up with the epoxy resin 15 grade of translucency. Soldering connection of each surface mount form light emitting diode 10 mentioned above is made for example, by the reflow method etc. at the substrate 20.

[0012] a group to which the lens 30 by which contiguity arrangement is carried out at each surface mount form light emitting diode 10 is flat, and the inferior surface of tongue arranged it to the top-face side at the longitudinal direction -- the boiled-fish-paste-like lens (cylindrical lens) 31 which counters the surface mount form light emitting diode 10 is installed in the vertical direction. The lens 30 is formed of acrylic resin, a polycarbonate, etc. Since a lens 30 is constituted as mentioned above, lens 30 the very thing is not equipped with directivity, as the vertical direction is shown in drawing 3 (a), and the dot-matrix display concerning this example is equipped with narrow directivity and shows it to drawing 3 (b) about a longitudinal direction depending on the direction of the light by which outgoing radiation is carried out from the surface mount form light emitting diode 10.

[0013] Next, an operation of the dot-matrix display mentioned above is explained. Although light

is emitted in all the directions from the light emitting diode component 12, as a result of the light which the light emitted to the side was reflected by the reflective frame 13, and was emitted below being reflected by the substrate 20, an optical-path change of each reflected light is made so that it may go upwards (luminescence side) in general. That is, the light emitted from the light emitting diode component 12 will be efficient, and will be turned upwards. Moreover, since incidence of the light by which outgoing radiation was carried out is carried out from the luminescence side of the surface mount form light emitting diode 10 by the small incident angle to the flat inferior surface of tongue of a lens 30, the light reflected on the inferior surface of tongue of a lens 30 is slight. That is, the optical loss by reflection of the inferior surface of tongue of a lens 30 is also suppressed to the minimum. It converges in the vertical direction by the cylindrical lens 31, and the light which carried out incidence to the lens 30 is emitted to the exterior. Since an excessive light of the vertical direction which is not recognized by the observer by being able to narrow directivity about the vertical direction and doing so since the height of the look of the observer who looks at a dot-matrix display is abbreviation regularity is no longer emitted, the luminous intensity of the part and a dot-matrix display can be raised.

[0014] In addition, although the dot-matrix display which consisted of surface mount form light emitting diodes 10 which contained one light emitting diode component 12 was taken for the example, this invention can also constitute the dot-matrix display in which 2 color specification is possible from an above-mentioned example, if not only this but surface mount form light emitting diode 10a which built in the light emitting diode components 12a and 12b of the different luminescent color as shown in drawing 4 is adopted.

[0015] <2nd example> drawing 5 is the decomposition perspective view having shown the outline configuration of the 2nd example of the dot-matrix display concerning this invention. Among drawing, since the component shown with the same sign as drawing 1 is the same configuration as the 1st example, explanation here is omitted. The description of this example is to have had two or more convex lenses 32 with which lens 30a by which contiguity arrangement is carried out counters each surface mount form light emitting diode 10 on a substrate 20 at each surface mount form light emitting diode 10 at the top-face side. The inferior surface of tongue of lens 30a is flat like the 1st example. The curvature of the vertical direction of the lens side of a convex lens 32 is larger than the curvature of a longitudinal direction. Consequently, although it is larger than the vertical direction as the vertical direction is shown in drawing 6 (a), directivity is narrowed and a longitudinal direction is shown in drawing 6 (b), are, it is and the directivity of extent has been obtained. This example is effective by making directivity on either side somewhat narrow at the part and the point which can raise the luminous intensity of equipment, when an observer looks at a display unit within limits restricted to some extent.

[0016]

[Effect of the Invention] Since the light emitted from the perimeter enclosure of a light emitting diode component is led to a luminescence side with a reflective frame, according to this invention, it can take out light efficiently, so that clearly from the above explanation. Moreover, since the inferior surface of tongue of the lens by which opposite arrangement was carried out at each surface mount form light emitting diode is flat, it decreases that the incident light from surface mount form light emitting diode is reflected on the lens inferior surface of tongue, loss light decreases so much, and the luminous intensity of a dot-matrix display goes up.

Furthermore, in the vertical direction which is not recognized by the observer while an observer can see a dot-matrix display from the large area of a longitudinal direction since the convergency of the vertical direction has become higher than the convergency of a longitudinal direction as for the convergent-lens structure with which the top-face side of said lens was equipped, since the exposure of light is controlled, the luminous intensity of the part and equipment can be raised.

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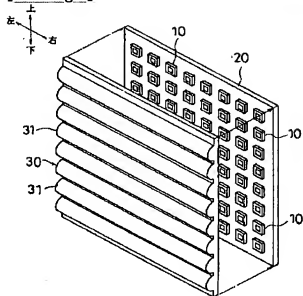
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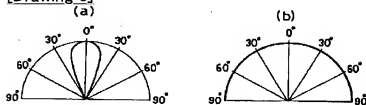
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DRAWINGS

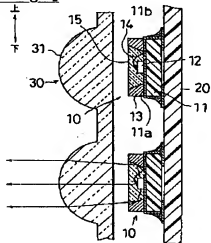
[Drawing 1]



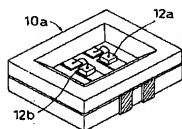
[Drawing 3]



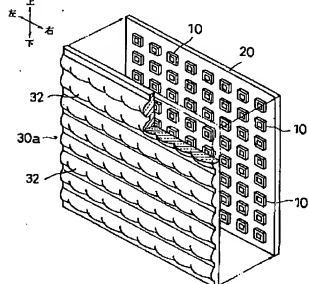
[Drawing 2]



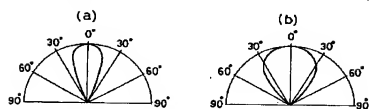
[Drawing 4]



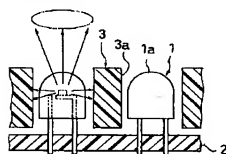
[Drawing 5]



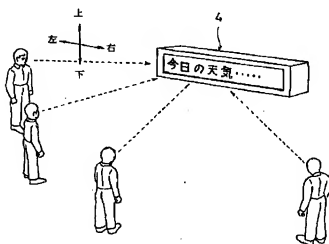
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]